Amendments to the Claims

The listing of claims will replace all prior versions, and listings of claims in the application.

1. *(currently amended)* A radio frequency (RF) mixer, comprising:
   a. an input transistor pair, configured to receive a baseband signal and a local oscillator (LO) signal;
   b. a plurality of submixers coupled to each other in parallel, configured to mix the baseband signal and ~~the LO signal~~ individual phase-shifted LO waveforms, each submixer in the plurality of submixers being driven by a single phase-shifted LO waveform and having a polarity that prevents cancellation of signals output from each other submixer in the plurality of submixers; and
   c. a tail current source configured to supply power,

wherein the plurality of submixers share the input transistor pair and the tail current source, and

wherein the LO signal is divided into a plurality of individual phase-shifted LO waveforms that create a piecewise linear waveform approximating the LO signal when combined, and a phase difference between any two time-adjacent individual LO waveforms in the plurality of individual LO waveforms is approximately equal to a phase difference between any other two time-adjacent individual LO waveforms in the plurality of individual LO waveforms.

2. *(cancelled).*

3. *(cancelled).*

4. *(previously presented)* The RF mixer of claim 1, wherein said phase difference is approximately 45 degrees.

5. *(previously presented)* The RF mixer of claim 1, wherein an ON time of an individual LO waveform in the plurality of individual LO waveforms does not overlap with an ON time of another individual LO waveform in the plurality of individual LO waveforms.

6. *(original)* The RF mixer of claim 1, wherein said plurality of submixers includes six submixers.

7. *(original)* The RF mixer of claim 6, wherein first, third, fourth, and sixth submixers output a signal that is scaled by sqrt(2)/2.

8. *(original)* The RF mixer of claim 6, wherein said LO signal comprises eight square waves summed into a piecewise linear signal.

9. *(original)* The RF mixer of claim 1, wherein only one submixer in the plurality of submixers is active at a time.

10. *(currently amended)* A method of RF mixing, comprising:

a. inputting an input signal to a plurality of submixers, each submixer in the plurality of submixers having a polarity that prevents cancellation of signals output from each other submixer in the plurality of submixers;

b. driving a switch on each of the plurality of submixers with a corresponding one of a plurality of individual LO waveforms such that only one of the plurality of submixers is active at a time, <u>wherein the plurality of individual LO waveforms create a piecewise linear waveform approximating a sinusoidal LO signal when combined and</u> wherein a phase difference between any two time-adjacent waveforms in the plurality of individual LO waveforms is approximately equal to a phase difference between any other two

time-adjacent waveforms in the plurality of individual LO waveforms;

c. mixing the input signal with the plurality of individual LO waveforms in active submixers; and

d. summing outputs of each of the plurality of submixers to generate a final output signal.

11. *(original)* The method of claim 10, wherein ON times of the plurality of individual LO waveforms do not overlap.

12. *(cancelled).*

13. *(previously presented)* The method of claim 10, wherein said phase difference is 45°.

14. *(original)* The method of claim 10, wherein said plurality of individual LO waveforms comprise eight square waves that, when summed, create a piecewise linear signal.

15. *(original)* The method of claim 10, wherein said input signal is an RF baseband signal, and said output signal is an intermediate frequency signal.

16. *(original)* The method of claim 10, wherein said input signal is an intermediate frequency signal, and said output signal is an RF baseband signal.

17. *(currently amended)* A mixer for extracting a baseband signal from an intermediate frequency (IF) signal, comprising:

a. an input transistor pair, configured to receive the IF signal and a local oscillator (LO) signal;

b. a plurality of submixers coupled to each other in parallel, configured to mix the IF signal and ~~the LO signal~~ individual phase-shifted LO waveforms to produce the baseband signal, each submixer in the plurality of submixers being driven by a single phase-shifted LO waveform and having a polarity that prevents cancellation of a signal output from each other submixer in the plurality of submixers; and

c. a tail current source configured to supply power,

wherein the plurality of submixers share the input transistor pair and the tail current source, and

wherein the LO signal is divided into a plurality of individual phase-shifted LO waveforms that create a piecewise linear waveform approximating the LO signal when combined, and a phase difference between any two time-adjacent individual LO waveforms in the plurality of individual LO waveforms is approximately equal to a phase difference between any other two time-adjacent individual LO waveforms in the plurality of individual LO waveforms.

18. *(cancelled).*

19. *(cancelled).*

20. *(previously presented)* The mixer of claim 17, wherein said phase difference is approximately 45 degrees.

21. *(previously presented)* The mixer of claim 17, wherein an ON time of an individual LO waveform in the plurality of individual LO waveforms does not overlap with an ON time of another individual LO waveform in the plurality of individual LO waveforms.

22. *(original)* The mixer of claim 17, wherein only one submixer in the plurality of submixers is active at a time.

23. *(currently amended)* A radio frequency (RF) mixer, comprising:

a. at least one input transistor pair configured to receive an input signal and a plurality of phase-shifted local oscillator (LO) waveforms, wherein the plurality of phase-shifted LO waveforms create a piecewise linear waveform approximating a sinusoidal LO signal when combined;

b. a plurality of submixers coupled to each other in parallel, configured to mix the input signal and the plurality of phase-shifted LO waveforms in such a way that only one submixer is active at a time, each submixer in the plurality of submixers being driven by a single phase-shifted LO waveform and having a polarity that prevents cancellation of a signal output from each other submixer in the plurality of submixers; and

c. at least one tail current source configured to supply power,

wherein a phase difference between any two time-adjacent individual LO waveforms in the plurality of LO waveforms is approximately equal to a phase difference between any other two time-adjacent individual LO waveforms in the plurality of LO waveforms.

24. *(original)* The RF mixer of claim 23, wherein said phase difference is approximately 45 degrees.

25. *(original)* The RF mixer of claim 23, wherein an ON time of an individual LO waveform in the plurality of LO waveforms does not overlap with an ON time of another individual LO waveform in the plurality of LO waveforms.

26. *(original)* The RF mixer of claim 23, wherein said plurality of submixers includes six submixers.

27. *(new)* The RF mixer of claim 1, wherein the LO signal is divided into a plurality of individual LO waveforms, each individual LO waveform driving a single submixer,

wherein each submixer shares the baseband signal and produces an output signal that is a scaled version of the baseband signal, and

wherein the sum of the output signals is a piecewise linear waveform.